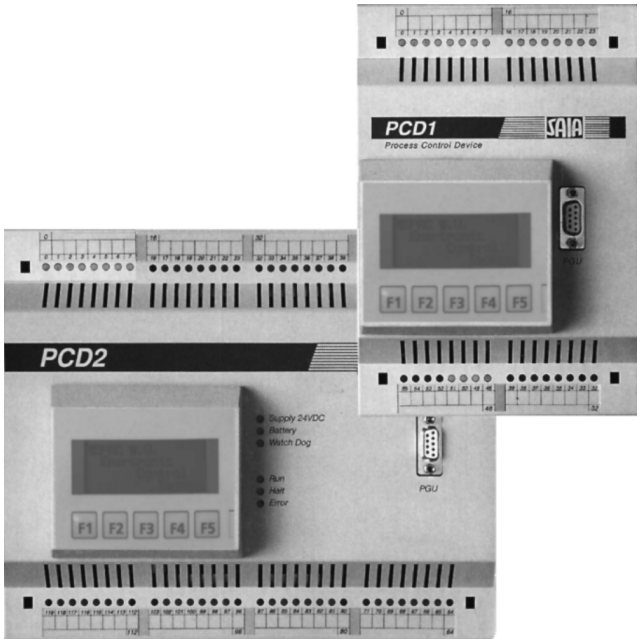
OPERATING MANUAL
Enertronic Control System
2

The integrated control system for Lennox chillers in the Ecologic range



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1. PREFACE

The Enertronic Control System 2 provides the functionality required to protect, control and operate your Ecologic chiller. It has the ability to operate those processes that take place in your chiller to the best advantage, thus guaranteeing efficient operation throughout the life of the machine.

Operation of the Enertronic Control System 2 is based around a number of software and hardware modules. These modules are combined to form a specific control system for the Lennox Ecologic chillers. The hardware for the control system comes in two versions, namely :

- Single circuit configuration

- Double circuit configuration

These user instructions describe the functionality of both configurations, including the necessary hardware. However, the availability of the different functions and the presence of the different hardware modules is determined by the configuration of your Lennox Ecologic chiller.

TO DETERMINE THE RELEVANT FUNCTIONALITY FOR YOUR APPLICATION, THIS USER MANUAL MUST BE CONSULTED IN CONJUNCTION WITH THE USER INSTRUCTIONS SPECIFIC TO YOUR LENNOX CHILLER

FOR ALL GUIDELINES PERTAINING TO SAFETY, USE AND MAINTENANCE AND WARRANTY, REFERENCE SHOULD ALSO BE MADE TO THE USER INSTRUCTIONS APPLYING TO YOUR SPECIFIC LENNOX CHILLER.

2. VERSIONS

2.1. Single circuit configuration

This configuration comprises an independently operating control system which provides the functionality to adapt the Enertronic concept to a single circuit Ecologic chiller in the WA-40E to WA-75E range. This functionality can be subdivided into three main groups :

-Safety functions
-Control functions
-Operating functions

2.2. Double circuit configuration

The same functionality as for the single circuit configuration applies to the double circuit configuration for machines in the WA-90D to WA-230D range. Only the control system (hardware) design differs so it is able to operate the extra components in your Ecologic chiller.

For machines in the WA-285D to WA-430D range, the same hardware configuration applies, but as these machines are designed with screw-type compressors, the functionality of the control system is different. This manual refers where necessary to the machine type.

FOR ALL CONFIGURATIONS, ONLY THOSE FUNCTIONS RELEVANT TO YOUR APPLICATION ARE AVAILABLE.

3. HARDWARE

The hardware for the Enertronic Control System 2 consists of a programmable logic controller (PLC). This PLC collects information from the chiller in the form of digital (1 or 0) and analog (0-10 volt and resistance) signals. The status of the digital inputs is indicated by LEDs (Light Emitting Diodes). Using these signals, the software in the PLC will generate control tasks for the main chiller components. Digital outputs, implemented as relay contacts and transistors, control the switching equipment for the main chiller components in order to perform the specified control tasks. The status of the digital outputs is also indicated by LEDs.

3.1. Hardware single circuit version

Figure 1 shows the control system for the single circuit version

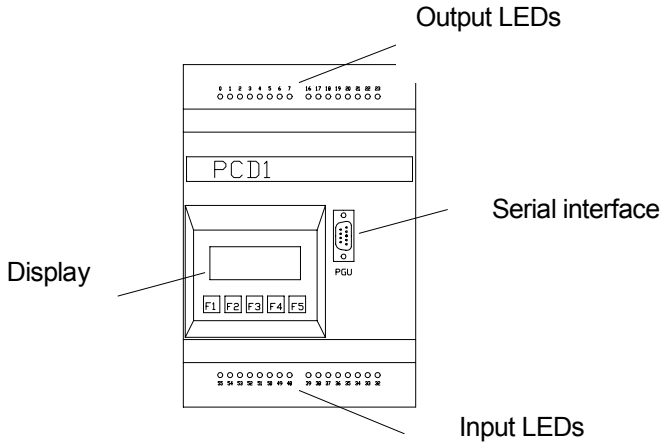

Figure 1 Single circuit control system

3.2. Hardware double circuit version

Figure 2 shows an overview of the control system for the double circuit version

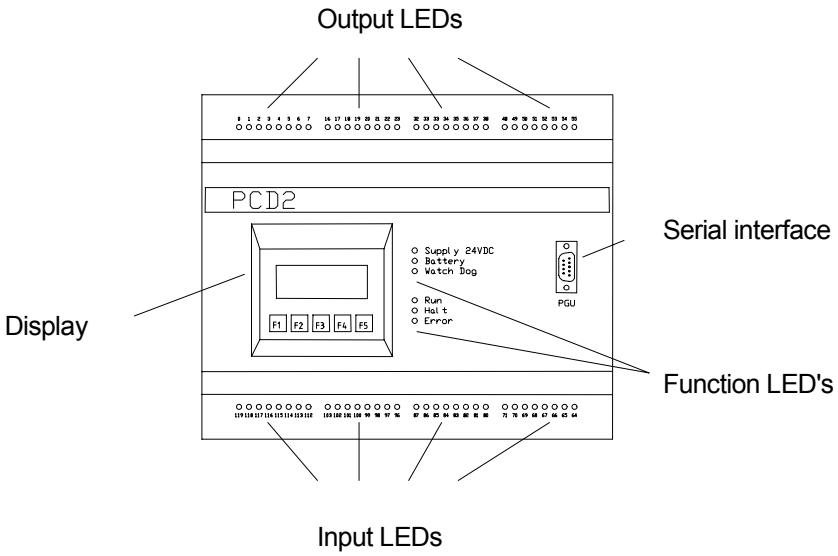

Figure 2 Double circuit control system

3.3. Function LEDs

The function LEDs provide information concerning the correct operation of the control system. In normal operation, the 'Supply 24VDC' and 'Run' LEDs will show a yellow light. If the status of the function LEDs is different, you should contact the service department at Lennox. One exception to this is the status of the 'Battery' LED. When this LED shows red, this indicates that the back-up battery in the control system is flat. Provided the machine is connected to the main voltage, this battery can be replaced during the periodic maintenance of your chiller. If the battery should become flat while the machine is disconnected from the main voltage, only the temporarily stored information (e.g. hour counters) will be lost. The software stored in non-volatile (eprom) memory will always remain stored. The functioning of the chiller cannot therefore be adversely affected by the battery running low. The standard life of a battery is 2 to 5 years.

Note: the function LEDs are not available in the single circuit version.

3.4. Inputs and outputs single circuit version, machine types WA-40E to WA-110E

The outputs numbered 0 to 23 inclusive are located on the top of the control. The inputs are grouped on the bottom of the control, numbered from 32 to 55 inclusive. The status of the respective input or output is indicated by LEDs (except for analog inputs). The following tables show the differents inputs and outputs. Where applicable, the status of the respective LED indicator during normal operation is also shown.

3.4.1. Digital outputs

Number	Function	LED indicator
0	Control compressor 1	*
1	Control compressor 2	*
2	Control compressor 3	*
3	Not used	n/a
4	Not used	n/a
5	Not used	n/a
16	Control condenser fan 1	*
17	Control condenser fan 2	*
18	Control condenser fan 3 / high-speed fan 1	*
19	Control expansion valve 1	*
20	Control expansion valve 2	*
21	Control evaporator heating	*
22	Control transmission pump evaporator circuit	*
23	Failure indication	On

Table 1, Numbering digital outputs * = Depending on present operating circumstances and machine configuration

3.4.2. Digital inputs

Number	Function	LED indicator
32	Starting command	On
33	Contact for flow or pump switch	On
34	Failure contact pump unit (optional)	On
35	High pressure protection input	On
36	Safety chain compressor 1	On
37	Safety chain compressor 2	*
38	Safety chain compressor 3	*
39	Safety chain condenser	On

Table 2, Numbering digital inputs * = Dependent on machine configuration

3.4.3. Analog inputs

Number	Function	LED indicator
48	Low pressure transmitter	n/a
49	High pressure transmitter	n/a
50	External setpoint adjustment (0-10VDC, optional)	n/a
51	Not used	n/a
52	Suction gas temperature sensor	n/a
53	Not used	n/a
54	Ambient temperature sensor	n/a
55	Water outlet temperature sensor	n/a

Table 3, Numbering analog inputs

3.5. Inputs and outputs double circuit version, machine types WA-90D to WA-230D

In this case as well, the outputs, numbered from 0 to 55 inclusive, are on top of the control and the inputs, numbered 64 to119, are on the bottom. The LEDs work in the same way as in the single circuit version. Table 4,5 and 6 provide a summary :

3.5.1. Digital outputs

Number	Function	LED indicator
0	Control compressor 1 circuit 1	*
1	Control compressor 2 circuit 1	*
2	Control compressor 3 circuit 1	*
3	Control compressor 2 circuit 1	*
4	Control compressor 2 circuit 2	*
5	Control compressor 3 circuit 2	*
16	Control condenser fan 1 circuit 1	*
17	Control condenser fan 2 circuit 1	*
18	Control condenser fan 3 circuit 1/ high-speed fan 1	*
19	Control expansion valve 1 circuit 1	*
20	Control expansion valve 2 circuit 1	*
21	Control evaporator heating	
22	Control transmission pump evaporator circuit	*
23	Failure indication	On
32	Control condenser fan 2 circuit 1	*
33	Control condenser fan 2 circuit 2	*
34	Control condenser fan 3 circuit 2/ high-speed fan 1	*
35	Control expansion valve 2 circuit 1	*
36	Control expansion valve 2 circuit 2	*
37	Not used	n/a
38	Not used	n/a
39	Not used	n/a
48 to 55	Not used	n/a

Table 4, Numbering digital outputs * = Depending on present operating circumstances and machine configuration

3.5.2. Digital inputs

Number	Function	LED indicator
65 to 71	Not used	n/a
80	Starting command	On
81	Contact for flow or pump switch	On
82	Peak load limiting	On
83	High pressure protection input circuit 1	On
84	Safety chain compressor 1 circuit 1	On
85	Safety chain compressor 2 circuit 1	On
86	Safety chain compressor 3 circuit 1	*
87	Safety chain condenser circuit 1	On
96	Failure contact pump unit (optional)	On
97	Input to activate second setpoint (optional)	*
98	Not used	n/a
99	High pressure protection input circuit 2	On
100	Safety chain compressor 2 circuit 1	On
101	Safety chain compressor 2 circuit 2	On
102	Safety chain compressor 3 circuit 2	*
103	Safety chain condenser circuit 2	On

Table 5, Numbering digital inputs * = Depending on present operating circumstances and machine configuration

3.5.3. Analog inputs

Number	Function	LED indicator
64	External setpoint adjustment (0-10VDC, optional)	n/a
112	Low pressure transmitter circuit 1	n/a
113	High pressure transmitter circuit 1	n/a
114	Low pressure transmitter circuit 2	n/a
115	High pressure transmitter circuit 2	n/a
116	Suction gas temperature sensor circuit 1	n/a
117	Suction gas temperature sensor circuit 2	n/a
118	Ambient temperature sensor	n/a
119	Water outlet temperature sensor	n/a

Table 6, Numbering analog inputs

3.6. Inputs and outputs double circuit version, machine types WA-285D to WA-430D

The inputs and outputs are arranged in the same way as in the previous configuration; operationally, there are differences however, as machines of types WA-285D to WA-430D use screw-type compressors.

3.6.1. Digital outputs

Number	Function	LED indicator
0	Control compressor 1	*
1	Control 75% capacity stage compressor 1	*
2	Control 100% capacity stage compressor 1	*
3	Control compressor 2	*
4	Control 75% capacity level compressor 2	*
5	Control 100% capacity level compressor 2	*
16	Control condenser fan group 1 circuit 1	*
17	Control condenser fan group 2 circuit 1	*
18	Control condenser fan group 3 circuit 1/ high-speed fan 1	*
19	Control economiser circuit 1	*
20	Control expansion valve 1 circuit 1	*
21	Control expansion valve 2 circuit 1	*
22	Control evaporator heating	*
23	Control transmission pump evaporator circuit	*
32	Control condenser fan group 2 circuit 1	*
33	Control condenser fan group 2 circuit 2	*
34	Control condenser fan group 3 circuit 2/ high-speed fan 1	*
35	Control economiser circuit 2	*
36	Control expansion valve 2 circuit 1	*
37	Control expansion valve 2 circuit 2	*
38	Failure indication	On
39	Not used	n/a
48 to 55	Not used	n/a

Table 7, Numbering digital outputs * = Depending on present operating circumstances and machine configuration

3.6.2. Digital inputs

Number	Function	LED indicator
65 to 71	Not used	n/a
80	Starting command	On
81	Contact for flow or pump switch	On
82	Peak load limiting	On
83	High pressure protection input circuit 1	On
84	Motor overload protection compressor 1	On
85	Thermistor / phase sequential protection compressor 1	On
86	Oil level protection compressor 1 (optional)	On
87	Safety chain condenser circuit 1	On
96	Failure contact pump unit (optional)	On
97	Input to activate second setpoint (optional)	*
98	Not used	n/a
99	High pressure protection input circuit 2	On
100	Motor overload protection compressor 2	On
101	Thermistor / phase sequential protection compressor 2	On
102	Oil level protection compressor 2 (optional)	On
103	Safety chain condenser circuit 2	On

Table 8, Numbering digital inputs * = Depending on present operating conditions and machine configuration

3.6.3. Analog inputs

Number	Function	LED indicator
64	External setpoint adjustment (0-10VDC, optional)	n/a
112	Low pressure transmitter circuit 1	n/a
113	High pressure transmitter circuit 1	n/a
114	Low pressure transmitter circuit 2	n/a
115	High pressure transmitter circuit 2	n/a
116	Suction gas temperature sensor circuit 1	n/a
117	Suction gas temperature sensor circuit 2	n/a
118	Ambient temperature sensor	n/a
119	Water outlet temperature sensor	n/a

Table 9, Numbering analog inputs

3.7. Transfer function analog sensors

In some cases (e.g. when troubleshooting) the transfer function of the analog measurement transducer must be known. This is as follows for the low and high pressure transmitters:

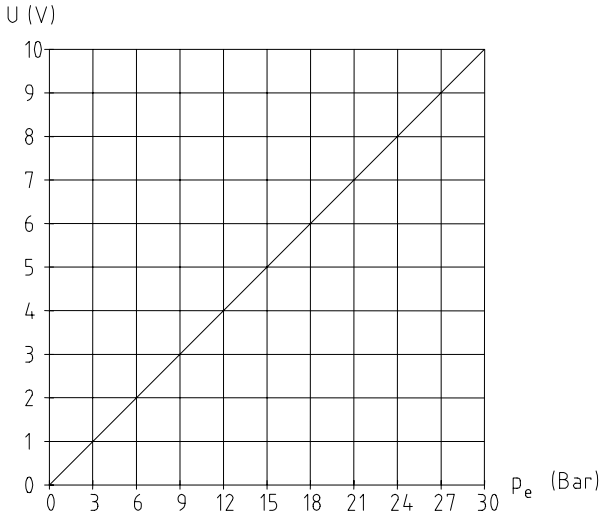

Figure 3 Transfer function high pressure sensor

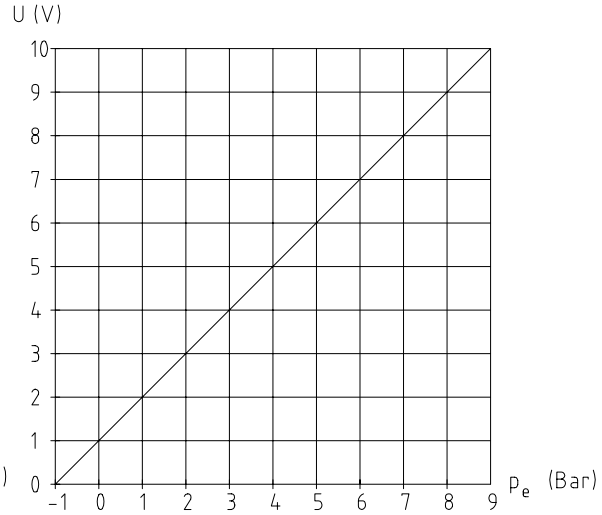

Figure 4 Transfer function low pressure sensor

Note: Pe = Effective pressure, or manometer pressure

The temperature sensors (water outlet, ambient air, suction gas) are of the type PT 2000. The relationship between temperature and resistance is as follows:

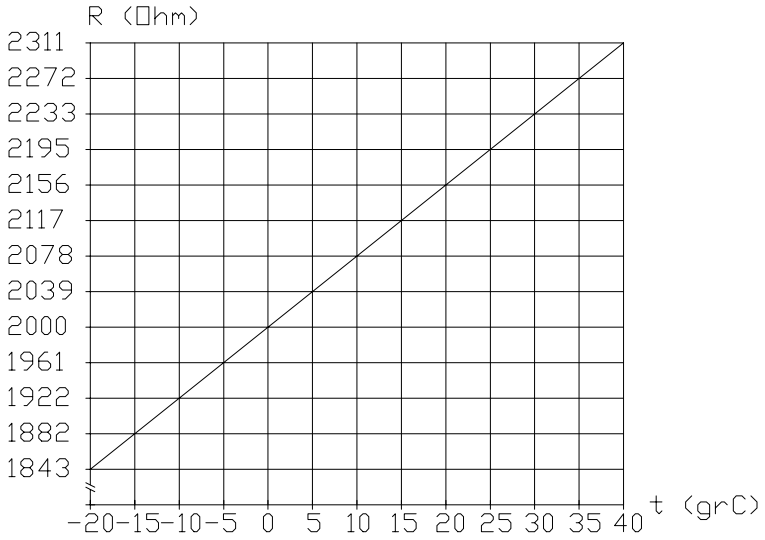

Figure 5, Relationship sensor resistance / temperature

4. SAFETY FEATURES

The Enertronic Control System 2 has extensive safety features for the different components used in your Lennox chiller. The safety features can be divided into four main groups, i.e.:

-Safety features for the evaporator

-Safety features for the compressors

-Safety features for the condensers

-General safety features

4.1. Safety features for the evaporator

The evaporator on your Lennox Ecologic chiller is protected from freezing by the Enertronic Control System 2. This is primarily achieved by monitoring the flow or differential pressure switch in the hydraulic system. An opened contact on this switch will lead after 5 seconds to disengaging of the compressors in your chiller. Too low a water outlet temperature will result in the disengaging of the compressors and engaging of the heating tape. If your Lennox Ecologic chiller is designed with a hydraulic module or pump unit, the electric heater unit in the integrated buffer tank is connected at the same time as the heating tape. If due to unforeseen circumstances the water outlet temperature drops still further, the controller will switch the chiller off (frost failure) using an electronic locking device. Too low an evaporation temperature in a refrigerant circuit, which may also result in freezing, is prevented by disconnecting the respective refrigerant circuit when the suction pressure of the compressors is lower than the permitted minimum over a certain time period. (LP failure, see safety features compressors).

If operated by the Enertronic Control System, the transmission pump in the hydraulic circuit will trip in at an ambient temperature of below 5°C.

Cause	Result	Limit values	Failure?	Reset required?
Low water outlet temperature	All compressors off; evaporator heating on, heating on in buffer tank (optional)	T1, <3.5°C *	No	No
Risk of freezing	Machine blocked	T2, <2.5°C *	Yes	Yes, general reset
Low ambient temperature	Transmission pump evaporator on	T4, <5.0°C		
Flow or pressure difference switch off	Machine stop after 5 sec.	Machine dependent	No	No
Too low evaporation temperature	Appropriate refrigerant circuit off	See 'safety features compressors'	Yes	Yes, general reset

Table 10, Evaporator safety features

* = In the case of glycol applications, another value will apply, see figures on p. 16.

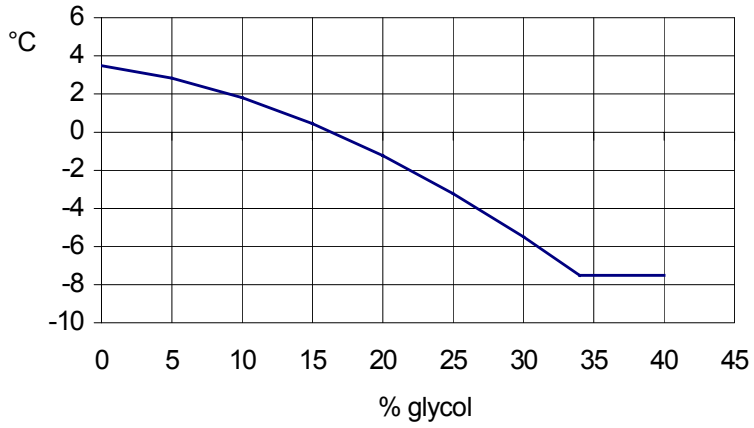

Figure 6, Disengaging in the event of low water outlet temperature

Figure 6 shows the relationship between the glycol percentage and the disengaging of all cooling capacity as well as the engaging of the evaporator heating and the heater unit in the buffer tank (optional)

Figure 7 shows, dependent on the percentage of glycol applied, the limit values for the water outlet temperature at which a frost failure will occur.

Figure 7, Frost failure limit values

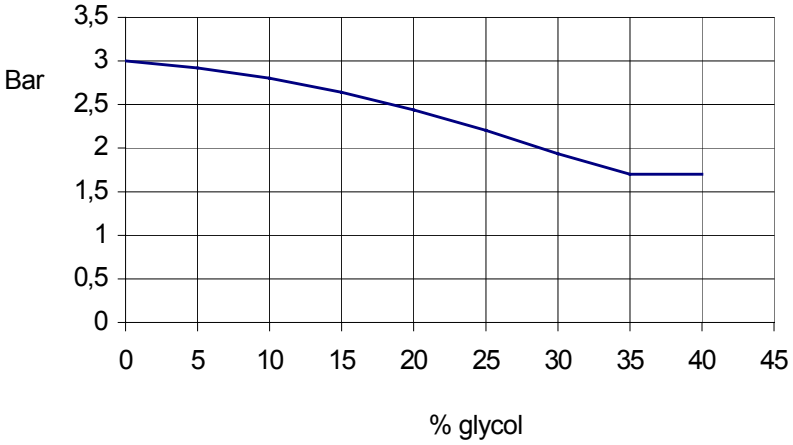

Figure 8 Low pressure detection values

Figure 8 shows the relation between the values at which (after a certain time delay) a low pressure failure is detected, and the glycol percentage applied in the secondary circuit.

4.2. Safety features for the compressors

The compressors in your Lennox chiller can be protected in different ways against external or undesired operating conditions. The possible safety features and their characteristics are shown in the following table.

Cause	Result	Limit values	Failure?	Reset required?
Engaging or interruption of the main voltage	Delay in engaging for oil warming	Maximum 6 hours *	No	No
Disengaging lowest capacity stage of single cooling circuit	Anti-cycling active; circuit remains disengaged	10 min if operating time > 5 min 30 min if operating time < 5 min	No	No
High discharge pressure	Reduction in cooling capacity (unloading)	0.94 x maximum discharge pressure	No	No
Too high discharge pressure	Compressor stop	Pressure switch value	Yes	Yes, on pressure switch
Low suction pressure (delayed)	Compressor stop after 6 min.	P1; 3 Bar**	Yes	Yes, general reset
Low suction pressure (direct)	Immediate compressor stop	0.2 Bar	Yes	Yes, general reset
High motor temperature (scroll compressors)	Compressor stop	Firmly set	Yes	No, automatic after cooling
High motor temperature (screw-type compressors)	Compressor stop	Firmly set	Yes	Yes, general reset
Faulty phase sequence in electrical supply (screw-type compressors)	Compressor stop	Anti-clockwise phase rotation	Yes	Yes, general reset
Oil level too low (screw-type compressors, split chiller)	Compressor stop	Firmly set	Yes	Yes, general reset
High motor current	Compressor stop	Machine dependent	Yes	Yes, on motor starters

Table 11, Compressor safety features

* = Interruption < 30 min: no wait time (except poss. anti-cycling), interruption > 30 minutes: wait time = time interruption lasts. Maximum = 6 hours. (e.g. on first start-up).

** = With use of glycol, see figure 8 (previous page).

4.3. Safety features for the condensers

The condenser fans in your Lennox Ecologic chiller are protected against overloading. This is achieved by internal protection elements and overload relays. In both cases, a failure will result in disengaging of the respective refrigerant circuit and the generation of a failure indication. When an internal motor protection trips, it is reset automatically after it has cooled down. If the fault is caused by an overload relay tripping, this must be resolved by resetting the respective relay.

4.4. General safety features

The table below shows the safety features which are not directly related to the evaporator, compressor or condenser on your Ecologic chiller, but which have a direct effect on the operation of the machine.

Cause	Result	Limit values	Failure?	Reset required?
Outside air temp. too low	Machine stop	-20°C	No	No
Faulty temperature sensor (water outlet, ambient or suction gas temp.)	Machine stop	Measured value < -50°C or > +60°C	Yes	No
Impermissibly small I action of expansion device*	Machine blocked	I < -20, for more than 5 min.	Yes	Yes, general reset
Impermissibly large I action of expansion device*	Machine blocked	I > 12, for more than 1 hour	Yes	Yes, general reset
Failure on transmission pump in evaporator circuit (optional)	Machine stop	Determined by pump type and protection	Yes	No

Table 12, General safety features

* = See control electronic expansion valve, chapter 5

4.5. General machine reset

If one of the safety features mentioned in this chapter trips, and needs to be cancelled by a general machine reset, you must use the display module. A general machine reset can then be initiated via the reset menu (F2, F2, F1, F3). (See chapter 6.1.1.4 for explanation, Reset mode).

5. CONTROLS

To operate your Ecologic chiller as efficiently as possible, the control functions for the main chiller components are integrated into the Enertronic Control System. A distinction is made between:

-Capacity control

-Condenser control

-Control of electronic expansion valve

5.1. Capacity control

To bring the cooling capacity of your Ecologic chiller into conformity with the loading in your application, the cooling capacity supplied is adjusted by the engaging or disengaging of the compressors or capacity stages (screw-type compressors). The engaging or disengaging of cooling capacity is performed on the basis of the water outlet temperature.

5.1.1. Water outlet temperature control

This control procedure enables the temperature of the water leaving the chiller to conform as accurately as possible to the required value (setpoint). A staged engaging of cooling capacity also modifies the water outlet temperature in steps. This “step response’ can vary depending on the number of compressors / capacity stages per compressor and the layout of the hydraulic system. The water outlet temperature controller uses an adaptive principle to calculate the ideal engaging and disengaging values for the compressor or capacity stage each time a compressor is engaged. In other words, the optimum bandwidth for each compressor is set each time one is engaged. This bandwidth is restricted to a minimum of +/– 0.5K and a maximum of +/- 2.0K with respect to the setpoint.

To adapt the operation of your Ecologic chiller perfectly to your application, there are a number of options to modify the setpoint of the water outlet temperature control.

5.1.1.1. Setpoint

As mentioned earlier, the setpoint is the desired value for the chilled medium leaving the chiller (water or water / glycol mix). This value can be modified manually using the display module on the control. For water applications, a setting range of 6°C to 12°C applies. In the case of water / glycol mixtures (≥ 34% glycol), the maximum range of -5°C to 12°C applies.

5.1.1.2. Analog setpoint adjustment

Analog setpoint adjustment provides the possibility of increasing or decreasing the operating range of your Ecologic chiller continuously to a maximum of 10K. This is achieved by converting a 0-10 VDC signal (sent from an external control circuit) into a setpoint setting (corresponding to 0 - 10K). The display module (F2, F1, F4) is used to select whether the 0-10 VDC signal results in an increase or decrease in the setpoint. (A decrease is naturally only possible in the case of glycol applications!)

5.1.1.3. Operation with two setpoints

Operating with two setpoints means that by closing a potential free contact, you can choose to activate a second setpoint. In comfort applications this function may, for example, be used if dehumidification is required. In process applications, this function may be used for ice buffer operation. The value of the second setpoint must be specified when ordering your Ecologic chiller.

5.1.2. Economiser operation

If your Ecologic chiller is designed with screw-type compressors, a subcooling system will, under certain conditions, come into effect to ensure even more efficient operation of your chiller. This system is termed 'economiser operation' and provides more subcooling of the liquid refrigerant fed to the expansion device.

5.1.3. Preference switch

In the case of chillers with two refrigerant circuits, based on the number of operating hours per circuit or a failure occurring, the preference for the circuit that will be engaged first is switched.

5.1.4. Peak load limiting

An input is reserved on the control system for activating peak load limiting. If a potential free contact associated with this input is closed (for example, during peak take-off of your electricity supply), then in the case of a two circuit chiller, the compressors in the second refrigerant circuit are disengaged. By doing so, you can temporarily halve the electricity consumption (and naturally the cooling capacity) of your Lennox chiller.

5.2. Condenser control

To adapt the condenser capacity to the cooling capacity to be supplied under different outside air conditions, a pair of controls are available: discrete control (on-off) and pulse-width control. The aim of both controls is to keep the condensation temperature as low as possible. The desired condensation temperature (35^{o}C) is reduced even more to make as efficient as possible use of the chiller when operating under partial load. (See figure 9.)

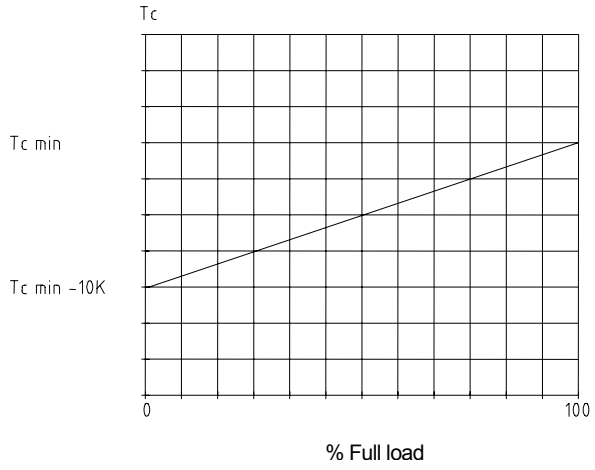

Figure 9 Reduction in condensation temperature when operating under partial load

5.2.1. Discrete control

This type of condenser control operates according to the 'conventional' principle of engaging and disengaging condenser fans. If the condensation temperature rises by 5K above the desired value, a fan will be switched on. If the condensation temperature is still above the specified value after 30 sec., another fan will be switched on. *The time constant of 30 seconds will be reduced to 1 sec. if the condensation temperature rises above 0.9 x the maximum value*. If, after switching on one fan and the elapse of a fixed time (75 sec), the condensation temperature has dropped to a value lower than the desired value, the appropriate fan will be switched off. The switch-on value for this fan will be set to the desired value + 10K.

5.2.2. Pulse width control

The principle on which this control is based is the switching on and off of a fan over a short period (cycle time = 5 sec). By varying the engaging and disengaging time, the speed of this fan can be set to any desired value between standstill and full load.
By using this type of control on the first fan of a condenser, the capacity of this condenser can be modulated. Thus, a condensation temperature may be maintained at exactly the desired value, provided the environmental conditions permit.

5.3. Controlling the electronic expansion valve

The Enertronic Control System 2 provides the exact refrigerant dosage to the evaporator. It achieves this by using process data provided by different measurement points in the chiller. Two ‘open / shut’ solenoid valves connected in parallel are used as the control device. These valves are operated with a certain time delay, so that the evaporator is fed with a uniform flow of refrigerant. The correct dosage is obtained by operating the valves using pulse-width control. The control action for the pulse-width control is determined by a calculated “feed forward” value, corrected using a P and I action based on the superheating achieved. The superheating to be achieved will be about 6K.

IN CERTAIN MACHINE CONFIGURATIONS ANOTHER VALUE MAY APPLY FOR SUPERHEATING

The superheating will be increased if, as the result of a very high water temperature, an impermissibly high loading of the compressors may result (‘MOP’ effect).

As already stated in the "general safety features”, too great a correction of the "feed forward" value by the I action will result in a failure indication.

6. OPERATION

Your Enertronic 2 chiller control system has a display unit containing 5 function keys. Using this display and the intelligence integrated in the software, your Lennox chiller can be operated simply and its operating status can be determined. The display has a 4-line LCD screen (Figure 7). As soon as one of the function keys is pressed, the LCD screen will light up. If no key is pressed for 1 hour, the lighting is dimmed. Using the function keys certain 'selection screens' or menus are selected. The tasks performed by the various function keys depends on the menu selected. Using an access code, certain operating parameters in your Ecologic chiller can be modified.

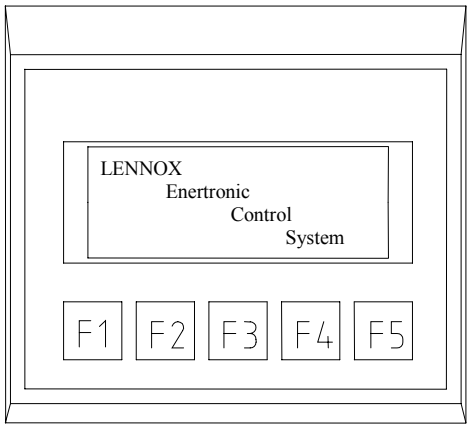

Figure 10 Display module

The following pages explain the various menus, Table 13, functions display module.

IT IS VERY IMPORTANT THAT OPERATING OR MAINTENANCE PERSONNEL ARE FAMILIAR WITH THE OPERATION OF THE DISPLAY SO THAT INFORMATION REGARDING THE OPERATION OF YOUR LENNOX CHILLER CAN BE RETRIEVED EFFICIENTLY.

6.1. Overview of operating functions

The operations that can be performed using the display module can be roughly divided into four groups: 'Measurements, Settings, Diagnose, Status'. In sequence, these functions provide the following options:

Measurements: This allows a choice to be made to read out the different values measured in your Lennox chiller.

Settings: The functions in the group 'settings' can be used to modify the desired values for different control circuits. Reset and test modes are also part of this group.

Diagnose: Using this function, the current operating status of your Lennox chiller can be determined very effectively.

Status: 'Status' stores functions that provide information concerning the functioning of specific components in your Lennox chiller.

These groups can be selected with the keys ***F1*** **to** ***F4*** from the **main menu.** The function keys can again be used to select a submenu within a group. Some menus provide the option, sometimes after keying in an access code, of operating or modifying specific things within the Enertronic Control System. The function key **F5** always has the same function, that is, to return to the **previously** selected menu.

THE NEXT PAGE PROVIDES AN OVERVIEW OF THE VARIOUS MENUS AND THEIR FUNCTIONS.

Note:

- The 'options menu' (F1, F3) is not applicable to your Ecologic chiller.
- The messages relating to the second refrigerant circuit are not relevant in the case of a single circuit chiller.

	Level 1	Level 2	Level 3	Level 4	Parameter
Main menu	***F1*** Measurements	***F1*** Refrigerant	***F1*** Circuit 1		Condensing pressure (Bar) Condensing temperature (°C) Evaporating pressure (Bar) Evaporating temerature (°C)
			F2 Circuit 2		Condensing pressure (Bar) Condensing temperature (°C) Evaporating pressure (Bar) Evaporating temerature (°C)
		F2 Secondary			Evaporator, water outlet temp. (°C) Setpoint water outlet control (°C) Ambient temeprature (°C) External control signal (V)
	F2 Settings	***F1*** Settings	***F1*** Setpoint water outlet control		Adjust, ***F2***=down ***F3***=up (°C)
			F2 Setpoint condenser control		Adjust*, ***F2***=down ***F3***=up (°C)
			F3 Setpoint EVe control		Adjust*, ***F2***=down ***F3***=up (°C)
			F4 *External setpoint adjust*		***F2*** *= increase* ***F3*** *= decrease (Only glycol applications!)*
		F2 Reset / test	***F1*** Reset mode		***F3***=activate
			F2 Test mode		***F3***=activate* (minutes; max 60)
		F3 Access			***F1*** t/m ***F5*** for access
	F3 Diagnose				Overall diagnose Diagnose circuit 1 Diagnose circuit 2 Sequence
	F4 Status	***F1*** Circuits			Percentage ½ Hours ran ½ Starts ½
		F2 EVe's	***F1*** Eve circuit 1		Feed forward action Integrating action Total action Superheat (K)
			F2 Eve circuit 2		Feed forward action Integrating action Total action Superheat (K)

Table 13, Functions display module

* = Only accessible with the correct 'access code'

6.1.1. Specific functions

A number of specific functions require further explanation.

6.1.1.1. Setpoint water outlet control

This can be used to modify the desired value of the water outlet temperature control. Changes of up to +6K with respect to the standard setpoint are possible. The standard setpoint (usually 6°C) is determined by the configuration of your Lennox chiller. The setpoint may also be lowered to –5.0 °C as long as your chiller is configured for glycol operation and the hydraulic system is filled with a water / glycol mixture with a sufficiently high degree of protection against freezing. Reducing or raising the desired value is achieved by pressing keys F2 or F3.

IN PARTICULAR, SETTING THE SETPOINT TO A VALUE *BELOW* THE FACTORY SETTING CAN TRIP THE SAFETY FEATURES OF YOUR LENNOX CHILLER IF THERE IS INSUFFICIENT WATER IN THE HYDRAULIC SYSTEM.

CERTAIN MACHINE CONFIGURATIONS WILL NOT PERMIT THE MINIMUM VALUE FOR THE SETPOINT TO BE SELECTED. PLEASE CONSULT THE RELEVANT TECHNICAL SPECIFICATION SHEET.

6.1.1.2. Setpoint condenser control

This can be used to modify the desired value for the condenser control system. The value can lie between 25°C and 55°C. The desired value is lowered or raised by pressing keys F2 and F3 respectively.

THE VALUE CAN ONLY BE MODIFIED IF ACCESS IS GAINED USING THE ‘ACCESS’ FUNCTION. INCORRECT SETTINGS CAN LEAD TO FAULTS IN THE CHILLER.

6.1.1.3. Setpoint EVe's

This is used to adjust the desired value for the control of the superheating (or the control of the electronic expansion valves). The value can lie between 4K and 15K. The desired value is lowered or raised by pressing keys F2 and F3 respectively.

THE VALUE CAN ONLY BE MODIFIED IF ACCESS IS GAINED USING THE ‘ACCESS’ FUNCTION. INCORRECT SETTINGS CAN LEAD TO FAULTS OR DAMAGE TO THE CHILLER

6.1.1.4. Reset mode

This menu allows the machine to be reset using function key F3. This reset may be necessary if the locking safety feature is tripped by the Enertronic Control System (chapter 4).

> REPEATED RESETTING OF THE INTERLOCKS AS A CONSEQUENCE OF INCORRECT SIZING OF THE HYDRAULIC SYSTEM, THE CHILLER, OR OTHER SETTINGS CAN RESULT IN DAMAGE TO THE CHILLER.

6.1.1.5. Test mode

The test mode provides qualified service personnel with access to a number of functions (crankcase heater delay, blockage with low ambient temperature, anti-cycling timers) whereby a rapid diagnosis can be made of the operation of your Lennox chiller. Test mode remains active for a maximum of one hour, after which it must be reactivated.

> OPERATION IS ONLY POSSIBLE ONCE ACCESS HAS BEEN GAINED USING THE 'ACCESS' FUNCTION. IMPROPER USE OF TEST MODE WILL LEAD TO FAILURE IN OR DAMAGE TO THE CHILLER.

6.1.2. Diagnose function

Tables 9 to 12 inclusive provide information regarding the possible messages that can be generated by the diagnose function (F3).

Diagnose circuit 1	10	Circuit OK
	11	Low pressure failure circuit 1
	14	High pressure failure circuit 1
	15	Oil level compressor 1 too low (optional)
	16	Motor overload protection compressor 1 tripped
	17	Thermistor / phase sequential protection compressor 1 tripped
	19	Temperature protection condenser fan(s) circuit 1 tripped
	21	Anti-cycling protection compressor 1 tripped
	22	High pressure capacity reduction circuit 1 active
	24	I action EVe circuit 1 > 12, for t > 1 hour
	25	I action EVe circuit 1 < -20, for t < 5 minutes
	26	Suction gas temperature sensor circuit 1 defective

Table 14, Diagnose register circuit 1

Diagnose circuit 2	30	Circuit OK
	31	Low pressure failure circuit 2
	34	High pressure failure circuit 2
	35	Oil level compressor 2 too low (optional)
	36	Motor overload protection compressor 2 tripped
	37	Thermistor / phase sequence protection compressor 2 tripped
	39	Temperature protection condenser fan(s) circuit 2 tripped
	41	Anti-cycling protection compressor 2 tripped
	42	High pressure capacity reduction circuit 2 active
	44	I action EVe circuit 2 > 12, for t > 1 hour
	45	I action EVe circuit 2 < -20, for t < 5 minuten
	46	Suction gas temperature sensor circuit 2 defective

Table 15, Diagnose register circuit 2

Overall diagnose	50	General preset values OK
	51	Delay for oil heating active
	52	Machine blocked due to too low ambient temperature
	53	Machine blocked due to too low water outlet temperature
	54	Frost protection tripped (control)
	56	Contact on flow switch not closed
	57	No start command present
	66	Water outlet temperature sensor defective
	67	Ambient temperature sensor defective
	68	Advance time transmission pump in the evaporator circuit active
	69	Lag time transmission pump in the evaporator circuit active
	70	Protection transmission pump / pump unit tripped

Table 16, General diagnose register

Sequence	1 = circuit 2 starts after 1
	2 = circuit 1 starts after 2

Table 17, Start sequence cooling circuits

Subject to modification

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